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Behaviour of Concrete by Partial Replacement of Coarse Aggregate with Recycled Plastic Granules

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ABSTRACT- In this paper All countries are focusing on sustainable technology that can be economical and adopted for the use of concrete in a better way. Concrete is most widely used construction material and it possess very low tensile strength, shear strength and brittle characteristics. In order to improve this property a new construction materials were developed through research and development work called asbestos fiber concrete and recron 3s fibers concrete. M30 gradeof concrete was designed. The addition of asbestos fiber and recron 3S fiberthe concrete. To determine the properties like tensile strength, compressive strength and flexural strength were performed at different ages like 7,14 and 28 days. The addition of asbestos fiber varies from 0%, 0.25%, 0.5%, 0.75%and 1% by volume of concrete and recron 3S fiber varies from 0%, 0.25%, 0.5%, 0.75% and 1% by volume of concrete.

KEYWORDS- Asbestos fiber concrete, Recron 3s fiberconcrete, Tensile strength and compressive strength.

I. INTRODUCTION

Concrete is used as building material, but fragile concrete has a disadvantage of relatively low tensile strength, low resistance to cracking and propagation, and weak tension. Under some assumptions, deformed reinforcing bars or pre-stressed tendons are provided in concrete to improve margins (RCC). It can usually be reinforced with a stronger material.

The drawbacks of plain concrete (without secondary reinforcement) are:

- Low shock and wear / abrasion resistance
- It is inherently fragile. That is, ductility should be improved.
- Range of bending and tensile strength improvement
- Damping / fatigue resistance improvement range
- Improvement range of energy absorption
- The reinforcing steel reinforcement cannot be adequately protected from corrosive water and saline infiltration.

Tension defects in plastic cement concrete and hardened concrete can be overcome by using existing reinforcing steelreinforcements and by including a sufficient amount of specific fibers [1]. So we are using fibers as secondary reinforcements. Fiber reinforced concrete (FRC) is a concrete containing fibrous material that increases the structural integrity of concrete [2]. It contains a uniform distribution and randomly oriented short discrete fibers. Fiber is a reinforcing material [3]. A fiber is a small piece of stiffener with certain characteristics [4]. Fiber is a building material to increase flexural and tensile strength and is considered a binder that can combine Portland cement and cement matrix [5]. Fibers include steel fibers, glass fibers, synthetic fibers and natural fibers. The characteristics of fiber-reinforced concrete also depend on the various concrete, fiber materials, geometry, distribution, direction and density. Fiber is a small stiffener with specific properties. It can be round or flat. Fiber is often described as a convenient parameter called "aspect ratio". The aspect ratio of fibers is the ratio of length to diameter. Typical aspect ratios range from 30 to 150.

II. MATERIALS

A. Cement

Deccan cement OPC 53 grade cement was used for this project. We evaluate the quantity required for this work, buy the full quantity and store it in the foundry. The following tests were performed in accordance with the IS code.

Figure 1: Cement

- Specific gravity (Le- Chatelier flask) (IS: 1727-1967)
- Slump test (Slump cone) (IS: 1199 – 1959)
- Sieve analysis (IS: 2306 (Part-1)-1963)
- Test of compressive strength of concrete. (IS: 516-1959)
- Test of Flexural strength test of concrete (IS: 516-1959)
- Split tensile strength test (IS: 5816-1999).

The cement used in this study is plain Portland cement (OPC)purchased from Deccan cement. This cement is the most widely used cement in the construction industry in ongole Ordinary Portland Cement (OPC) is the most important cement type. When tested according to IS 4031-1988, OPCs were classified on the 28th day according to the strength of cement into three grades: 33 grades, 43 grades and 53 grades.28 days' strength is 33N / mm2, 43N / mm2 and 53N / mm 2or more, respectively, and it is called cement of grade 33, 43and 53 respectively. Portland cement grade 53, which complies with IS: 8112-1989 and IS 12269-1987, is used for this experiment. Severalproperties of cement are shown in the table below. Adhere to a variety of standard tests according to IS recommendation

B. Fine Aggregate

The fine aggregate used in this investigation was clean river sand and the following test carried out in sand according to IS: 2386-1968 (iii). Specific Gravity Analysis and Fine Coefficient. Fine aggregates (i.e., 10 mm) and fine sand, typically the same material used in conventional concrete mixtures. Gradient tests performed on agglomerates have shown that they meet specification requirements. Fine adjustment sizes less than 4.75 mm are considered fineaggregates.

Figure 2: Fine Aggregate

The particles should be free of clay or inorganic materials and the long-term sedimentation tests should be difficult to confirm in the presence of organic materials and sludge in the fine aggregates. It is stored in an open space without dust or water. It complies with the IS 383 1970 standard belonging to Zone II. The physical properties of the fine aggregate used are shown in the table below.

C. Coarse Aggregate

In this survey, we used a shredded granite stone of a size that is less than 20 mm in size and various tests beneath it.

- Specific gravity (IS: 2386-1968, Part 3)
- Sieve Analysis and Precision Coefficient (IS: 2386-1968, Part 3)

Total size is > 4.75 mm and is considered a coarse aggregate. It can be found on the original rock. Rough aggregates have other shapes such as round, irregular, or partially rounded, angled, or sheet-like. They must be free of organic impurities and the dust content is negligible. There is a lot of controversy as to whether colloidal or round aggregates will form a better concrete. If you need all the round accounts for economic reasons; It must be broken and then used. However, the angular aggregate is greater than the round aggregate in the following two points.

- Interlocking effect with concrete is excellent.
- The total surface area of coarse tissue aggregates is a smoother rounded aggregate for a given volume.

Figure 3: Coarse Aggregate

Used the dried angle coarse aggregates with a maximum size of 20 mm and a minimum size of 10 mm that are locally available used for the experiment.

D. Water

Water is an important ingredient in concrete because it is actively involved in chemical reactions with cement. This is due to the strength imparted to the cement gel and the workability of the concrete. You should carefully check the quantity and quality of the water. Portable water for concreteis used.

Table: 1: Physical Properties of Water

S. No	Properties	Value
1	PH	7.25
2	Taste	Agreeable
3	Appearance	Clear
4	Turbidity(NT units)	3.85

Figure 4: Water

E. Asbestos Fibers

Asbestos is a term used to refer to six naturally occurring silicate minerals. All are composed of long and thin fibrous crystals, each fiber being composed of many microscopic 'fibrils' that can be released into the atmosphere by abrasion and other processes. Asbestos is an excellent electrical insulator and is highly heat-resistant, so for many years it was used as a building material. However, it is a well- known health and safety hazard, and today, the use of asbestos as a building material is now illegal in many countries. Inhalation of asbestos fibers can lead to various serious lung conditions, including asbestosis and cancer.

Figure 5: Asbestos Fibers

F. Asbestos Properties

Table 2: Asbestos Properties

Asbestos fiber	Fiber length(mm)	1-80
	Specific gravity	2.55
	Tensile strength(MN/m2)	3100
	Hardness(Ms)	2.5-4.0
	Color	White
	Flexibility	Good
	Electric charge	Positive

G. Characteristics of asbestos

Asbestos was first discovered by the Greeks and Romans in the 18th century where they referred to it as a Miracle Mineral.

Asbestos is obtained by extraction of asbestos-containing rock which is crushed and milled to produce a thread like fibrous material known as asbestos. The asbestos thus obtained contains thousands of fibers which can be further divided into microscopic fibrils.

Asbestos is majorly divided into two types based on the crystalline structure:

- Serpentine – Sheet or a layered structure.
- Amphibole – Chain like crystal structure.

Chrysotile, the only mineral in the serpentine group, is the most commonly used type of asbestos and accounts for approximately 95% of the asbestos that finds use in different purposes. Chrysotile is commonly known as “white asbestos”.

H. Asbestos in Cement

Most of the asbestos concrete components are made up of using asbestos cement due to the high risk of consumption of asbestos fibers through inhalation. Generally, 10-15% of the cementetious material is replaced with asbestos in the production process of cement.

I. Asbestos in Concrete

As asbestos is a very hazardous material, use of raw asbestos fiber for the concrete mix at the site is not recommended. But under a controlled environment, the useof asbestos fiber in concrete is permissible.

J. Effect of Asbestos on Concrete’s properties: Compressive Strength

Tests conducted on concrete with varying percentage of

asbestos fiber show that the compressive strength of the concrete is most when 0.75% of cement is replaced with asbestos fibers. The strength of 0.75% fiber reinforced concrete is 40.89MPa whereas that of conventional concrete is 30 MPa.

From the results, it can be clearly seen that there is an increase of 33% in compressive strength with the introduction of asbestos fiber in concrete to that of conventional concrete.

K. Flexural Strength

Test conducted on concrete with varying percentage of asbestos fiber also show that the flexural strength of the concrete is most when 0.75% of cement is replaced with asbestos fibers. The strength of 0.75% fiber reinforced concrete is 6.27 MPa whereas that of conventional concreteis 5.13 MPa.

By comparing the two, it can be clearly seen that there is an increase of 23% of flexural strength with the introduction of asbestos fiber in concrete to that of conventional concrete

L. Role of Asbestos

Asbestos is a naturally occurring thin crystalline long fiber which when used for the preparation of concrete improves the fresh and hardened properties of concrete such as compressive and flexural strength. In the

construction industry, it finds its application in heat and acoustic insulation, fireproofing, roofing and flooring jobs. Controlsplastic settlement. It improves the post-peak ductility of concrete. Increases wet and dry abrasion resistance. Increased impact / fracture resistance. Moisture penetration and reduced concrete permeability. Increases toughness of hardened concrete. It reduces the effects of damage from freeze thaw cycles. It improves the long-term durability ofconcrete. Therefore, adding fibers to the cement concrete matrix will cause these cracks to bridge and no longer open.To get more deflection from the beam, additional force andenergy is required to pull or break the fiber. In addition to preserving the integrity of the concrete, this process improves load carrying capacity beyond the cracking of structural members.

M. Fiber mechanism

Fibre works with concrete through the use of two mechanisms, the mechanism of spacing and the mechanism of filling cracks. The spacing mechanism requires the expansion of a large number of well dispersed fibres withinthe concrete matrix to capture existing small fractures that can cause cracking of the sound. For a typical fibre segment, small diameter fibre or micro fibre can be used toensure the number of fibres required to stop the fine cracking. There are more than 67 million fibres in m3 of concrete that we hold at cement base. This suppresses shrinkage stresses (micro cracks and reduced permeability). Fibre matrix improves energy absorption and abrasion resistance

Round fibres are used in the world. These fibres tend to escape from the cement base when applying the load. Aftermany years of research, Recron3s was developed in the form of a triangle that provides improved mechanical links with the cement matrix. Michigan State University found that triangular fibres improve the bond strength by 40% compared to circular fibres. Recron3s is polyester fibre and polypropylene monofilament. It is specially designed and moulded of synthetic fibres (trigonometric) for use in concrete and mortar to overcome deficiencies in concrete. Triangular fibres provide higher surface bonding.

N. Fibre Matrix Interaction

The tensile fracture (less than 1/50) of the cement matrix is significantly less than the final yield or strain of steel fibre. As a result, loading the fibre-reinforced composite breaks the matrix long before the fibre breaks. When the matrix breaks, tensile stress, peak stress, peak strain continuously increases, higher than the matrix alone, and multiple cracks occur in the matrix in the inflexible area between the first and peak segments.

O. *Recorn 3s*

Recron 3s is a virgin polyester & polypropylene monofilament fiber. They are synthetic fibers (triangular) designed specifically for use in concrete and mortar to overcome deficiencies in concrete. Triangular fibers provide higher surface links. The combination of separate discrete short fibers in the concrete matrix provides a randomly distributed, randomized, randomized distribution, resulting in a three- dimensional mechanism for controlling cracks and stopping cracks.

Figure 6: Recorn 3s

P. Role of Recron3s

There is a risk of corrosion because cracks play the main role in transforming concrete structures into permeable elements. Cracking not only degrades the quality of the concrete but also makes the building aesthetically unacceptable and destroys the structure. It is therefore important to reduce crack width by adding polypropylene fibers to the concrete. Split tensile strength is 2.5 times higher than conventional concrete. The flexural strength has increased 2.5 times compared to conventional concrete. Reduction of intrinsic plastic and dry shrinkage cracking. Controls plastic settlement. It improves the post-peak ductility of concrete. Increases wet and dry abrasion resistance. Increased impact / fracture resistance. Moisture penetration and reduced concrete permeability. Increases toughness of hardened concrete. It reduces the effects of damage from freeze thaw cycles. It improves the long-term durability of concrete. Therefore, adding fibers to the cement concrete matrix will cause these cracks to bridge and no longer open. To get more deflection from the beam, additional force and energy is required to pull or break the fiber. In addition to preserving the integrity of the concrete, this process improves load carrying capacity beyond the cracking of structural members.

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S. Recorn 3s Properties

Table 3: Recorn 3s Properties

Recorn 3s Fiber	Cut length	6mm
	Diameter	0.04mm
	Tensile strength	4000-6000 kg/cm^2
	Aspect ratio	150
	Specific gravity	1.34-1.40 cc/g
	Melting point	> 250^{0}C
	Elongation	>100%

III. EXPERIMENTAL PROCEDURES

Tests On Concrete
Workability of fresh concrete by slump test:
Slump Test

A. Workability

By using this slump test is to determine the workability of fresh concrete. Followed by a slump test according to IS: 1199-1959.
Workability is a term associated with freshly prepared concrete. This can be defined as the ease with which concrete can mixed, placed, compacted and finished. Slump test is the most commonly used method of measuring 'workability' of concrete in a laboratory or at site of work. It is used conveniently as a control test and gives an indication of uniformity of concrete from batch to batch. Vertical settlement of a standard cone offreshly prepared concrete is called 'slump'.

B. Procedure

Thoroughly clean the inside surface of the mold and removeany unnecessary moisture and old concrete before starting the test. Secure the slump cone to the pedestal. The pedestal should be smooth, level, solid, and nonabsorbent. Lubricate the inner wall of the slump cone so that the concrete does notstick to the wall of the slump cone. Measure the height of theslump cone. Let it be "h1" cm. Preparation of concretemixture: Mix dry cement and sand first until a homogeneous mixture is obtained. Put rough coarse aggregate into this mixture and mix the three components again. Add water according to the given w / c ratio and prepare for homogenous mixing. The mold is then filled with four layers,almost a quarter of the height of the mold. Each layer is filled25 times by loading a dump to distribute the border evenly across the cross section. For the second and subsequent layers, the staple rod must penetrate the bottom layer. Once the top layer is flooded, hit the top with a shovel to ensure that the mold is properly filled. The mold is slowly and carefully lifted in the vertical direction and immediately removed from the concrete. Once the concrete adjustment isstopped, we measure the concrete adjustment. In other words, the height of the concrete is measured by measures the difference between the height of the mold and the highest point of the flat concrete (OR) and "h2" cm. The difference between h1 and h2 provides a slump.

Slump value = (h1-h2) cm.

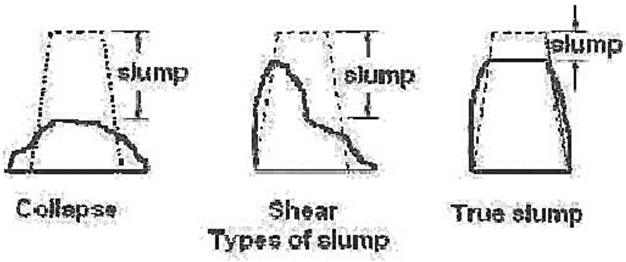

Figure 7: Procedure

Showing Different Types of Slump Behaviour

- COLLAPSE: - In a collapse slump the concrete collapses completely
- SHEAR: - In the shear fall the top of the concrete shears off and lateral slips.
- TRUE: -In a true slump the concrete simply subsides, keeping more or less to Shape.

C. Working Procedure Of Experiment

- Percentage of Fibers used: 0.25%, 0.5%, 0.75% and 1%
- Number of curing days: 3 days, 7 days, 28 days.
- Number of cubes per batch: 3
- Total number of cubes/cylinders/prisms: 45
- Total number of specimens: 135

D. Sieve Analysis (or) Fineness Modulus of Fine And Coarse Aggregates

Aggregates are divided into two categories depending on size

- Fine aggregate
- Coarse aggregate

The size of aggregates greater than 4.75 mm is a rough assembly and a total size of 4.75 mm and less is considered a fine collection. In order to ensure that all particle sizes exist, the fineness modulus property is defined. The purity coefficient is an experimental factor obtained by adding the cumulative percentage of the total held on each of the standard sieves ranging from 150 microns and dividing this amount by 100.

Table 4: Coarse aggregate

Limits of fineness Aggregate (max. size)	For Different Aggregate Fineness modulus	
	MIN	MAX
Fine Aggregate		
i)Fine sand	2.20	2.60
ii)Medium sand	2.60	2.90
iii)Coarse sand	2.90	3.20
(20mm)	6.00	6.90
(40mm)	6.90	7.50
(75mm)	7.50	8.00

Limits of fineness modulus of fine and coarse aggregate

Table 5: Maximum Substantial

Maximum size present in Substantial proportions (mm)	Minimum weight of sample to be taken for sieving (kg)
63	50
50	35
20 or 16	02
12.50	01
10	0.50
6.30	0.20
4.75	0.20
2.36	0.10

If the test aggregates have a high F.M, the mixture willbe rough and on the other hand if the F.M is low the mixing will be uneconomical.

E. Procedure

1) Fine Aggregate

Take 1 kg of dry air and the aggregate is sand. Place the test specimens in the order of No.480, 240, 120, 60, 30 and 15 and place No.480 on top and No.15 on the bottom. Place thepan and lid on the bottom of the pan at the top and secure it to the sieve shaking machine. Keep the sand on the top sieve(No: 480). Perform sieving for about 10 minutes. Separately weigh the material retained in each sieve.

2) Coarse Aggregate

Take 10 kg of dried rough aggregate. Shake the sieve by handand shake each sieve in the order of 80mm, 40mm, 10mm, 480micron for 2 minutes or more. Shaking moves in a varietyof movements back and forward, circular left to right, clockwise and anticlockwise to maintain material moving over the body in the direction of frequent movement. Find the weight of the material retained in each sieve.

3) Minimum weights of sample for sieve analysis

F. Test on cubes for compression strength

The strength test was performed in accordance with IS 516 for compressive strength tests of cubes of 150 mm at 7 days and 28 days. Since compression testing is the most common test performed on a hardness test, and partially smooth, most of the desired properties of concrete are partially correlated with compressive strength. The compressive strength test samples were 150 mm x 150 mm x 150 mm. The samples were tested at 2000 kN after 28 days of treatment. compressive tests shall be carried out on cubic or cylindrical specimens. The publication is also used but is uncommon inour country. Sometimes the compression strength of the concrete is determined by using part of the package tested atthe flex. The end of the beam remains uncontaminated after the bending failure, and the beam section is rectangular, so you can use this part of the beam to determine the compression strength. The length of the cylindrical sample istwice the diameter.
The cured cube specimen as described above is removed from the curing tank and tested according to standard procedures and allowed to dry in the shade. The cubes are tested with a 2000 KN capacity compression tester and the results are tabulated.

Figure 8: Test on cubes for compression strength

Compression Testing Machine

G. Test On Cylinder For Split Tensile Strength

Among all indirect tensile test methods, this method is easy to perform and provides more uniform results than other tensile tests. The strength determined in the spilt tensile test is not affected by the true strength of the concrete, the rupture coefficient. Split strength provides a value approximately 5- 12% higher than direct tensile strength.

H. Test placement and testing details are as follows

The compression tester used to determine the tensile strength of the cylinder is the standard mark. The machine is equippedwith a control valve, so the loading speed can be adjusted. The machine was calibrated at the standard loading rate. It cleans the pattern, checks the oil level, and remains ready totest on all sides. The diameter of 150 mm diameter cylinder and 300 mm diameter shall be tested for separation tension using a 2000 KN test instrument. When the load is applied along the conduction rod, the elements in the vertical diameter of the cylinder are exposed to vertical pressure andhorizontal pressure (2p /

LD). It is observed that the cylinder is divided into two halves.

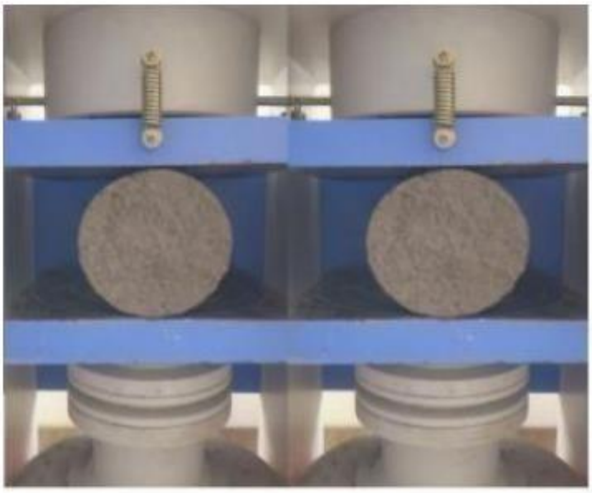

Figure 9: Split Tensile Test

Split-tensile strength = **2P /π LD**

I. Test on beam flexural strength

Concrete as we know is relatively strong in compression and weak in tension. In reinforced concrete elements, a little bit of reliability is placed in the tensile strength of the concrete where the steel reinforcement bars are provided that can withstand all tensile forces. However, tensile pressures can occur in concrete due to drying shrinkage, corrosion of reinforcing steel, temperature gradients and many other causes. Therefore, knowing the tensile strength of concrete is important. It is difficult to directly find the tensile strength of concrete. No test specimens or test equipment have been designed to ensure a uniform distribution of "pull" applied concrete. Several investigations have been made, including direct measurement of tensile strength, but beam tests have proven to be reliable in measuring the bending strength properties of concrete in beams. The load system used to determine emotional stress is to hold the central point and carry 3 points. The maximum fiber stress will occur in the load of the center point below the point of loading at which the bending moment becomes the maximum. For a symmetrical two-point load, a crack may appear in any position where the bending moment is not strong enough to withstand the intermediate third stress. It can be expected thatthe two point loads have lower values of the rupture coefficients than the center point loads. The standard size ofthe sample is 100mm * 100mm * 500mm. The sample is placed in the machine in such a way that the load can be applied to the casting face. After aligning the sample axis with the load device axis, the load was applied at an increasing rate without effect, and the load applied to the failure was note down. Flexural strength of the specimen is expressed in terms of modulus of rupture fcr.

fcr= PL/BD2

Figure 10: Test on beam flexural strength

IV. RESULTS AND DISCUSSIONS

The results of various strength and durability tests are presented and discussed in this chapter. A flowchart showing the details of the program is displayed.

Table 6: Properties of Cement

S.NO	Properties /Characteristics	Test results	Requirements as per IS 12269-1987
1.	Setting times		
	Initial setting time	45 min	Not less than 30min
	Final setting time	480 min	Not more than 600min
2.	Specific Gravity	2.93	IS 456-2000
3.	Consistency of Cement	32%	26-33% as per code.

Table 7: Sieve analysis of the aggregate

+	I.S. Sieve No.	Weight Retained (gm)	Percentage Weight Retained	Percentage Passing	Cumulative percentage retained
1.	80mm	0	0	100	0
2.	40mm	0	0	100	0
3.	20mm	0	0	100	0
4.	10mm	0	0	100	0
5.	4.75mm	24	2.4	97.6	2.4
6.	2.36mm	44	4.4	93.2	6.8
7.	1.18mm	168	16.8	76.4	23.6
8.	600μm	300	30.0	46.4	53.6
9.	300μm	274	27.4	19	81
10.	150μm	190	19.0	0	100
Total:					267.4

Table 8: Test on beam flexural strength

S. No.	Property	Test result	IS Code number
1.	Specific Gravity	2.67	IS 2386 (Part-3) -1986
2.	Fineness Modulus	2.674	IS 2386 (Part-1)-1986

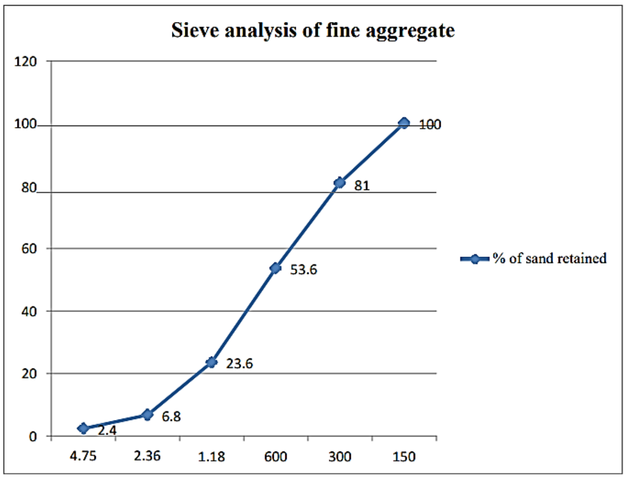

Figure 11: Sieve analysis of fine aggregate

A. Properties of Fine Aggregate

Table 9: Properties of Fine Aggregate

S. No.	I.S. Sieve No.	Weight Retained (gm)	Percentage Weight Retained	Percentage Passing	Cumulative Percentage Retained
1.	80mm	0	0	100	0
2.	40mm	1042	20.84	79.16	20.84
3.	20mm	1474	29.48	49.68	50.32
4.	10mm	1702	34.04	15.64	84.36
5.	4.75mm	782	15.64	0	100
6.	2.36mm	0	0	0	100
7.	1.18mm	0	0	0	100
8.	600µm	0	0	0	100
9.	300µm	0	0	0	100
10.	150µm	0	0	0	100
Total					755.52

B. Sieve analysis of coarse aggregate

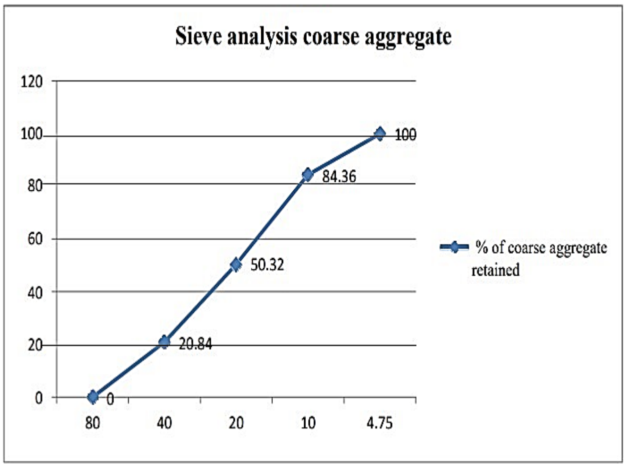

Figure 12: Sieve analysis coarse aggregate

C. Properties of Fine Aggregate

Table 10: Properties of Fine Aggregate

S.no	Property	Test Result	IS Code number
1.	Specific gravity(G)	2.704	IS 2383 -1986
2.	Fineness Modulus	7.55	IS 2383 (Part-1)-1963

D. Slump test values

The workability of fresh concrete is evaluated by slump cone test which relates to the ease with which concrete flows during placement. The following table gives the slump value of each mix which was measured before casting the specimens.

Table 11: Slump test values

Percentage of fiber (%)	Slump (mm)
0	203
0.25	206
0.5	210
0.75	212
1	217

The compressive, split tensile and flexural strength values are

E. Compressive Strength Values

Table 12: Compressive Strength Values

S.no	Fiber percentage	7 days Compressive strength (N/mm^2)	14 days Compressive strength (N/mm^2)	28 days Compressive strength (N/mm^2)
1	0 %	15.25	25.17	39.58
2	0.25%	16.18	27.25	40.13
3	0.5%	18.29	29.13	41.53
4	0.75%	17.13	26.28	39.93
5	1%	16.92	26.15	38.85

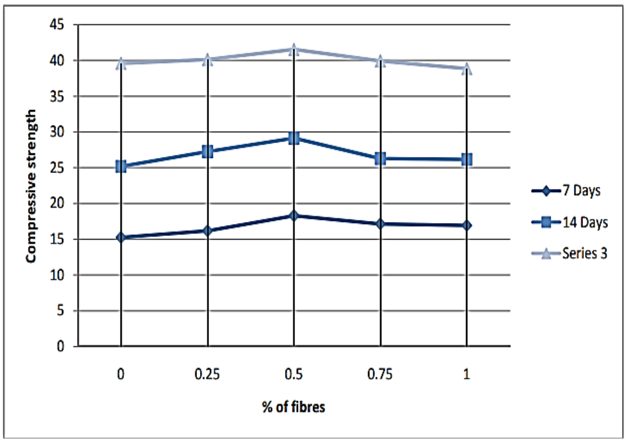

Figure 13: Compressive Strength

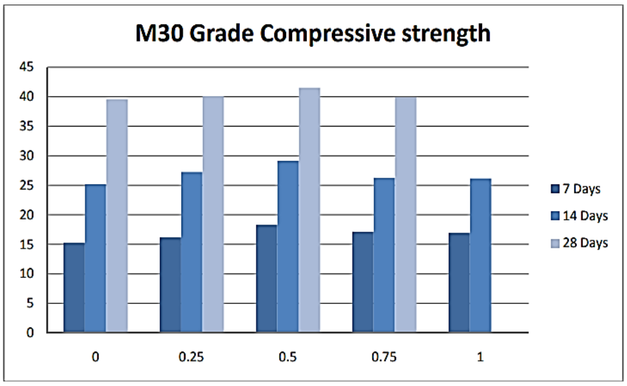

Figure 14: M30 Grade Compressive Strength

F. *Compressive strength Graphs Addition of Asbestos and Recron3s fibers*

1) *Results and discussions*

The compressive strength values were obtained by testing standard cubes made with different concrete mixes with different percentages fibers are addition to cement. It was observed that the compressive strength is increased at 0.5% of fibers addition to cement at all ages. The % increase of strength at 3 days is 16.01 N/ mm2 which is 21.98 N/mm2 as compared to conventiona l mix that is 18.46 N/mm2. The % increase of strength for 7 days is 11.66 N/mm2, which is 36.86N/mm2 as compared to conventional mix that is 32.56 N/mm2. The % increase of strength for 28 days is 7.66 N/mm2, which is 53.64 N/mm2 as compared to conventional mix that is 49.53 N/mm2 So that, 0.75% of fibers addition to cement gives better compressive strength results.

2) *Split Tensile Strength Values*

Table 13: Split Tensile Strength Values

S.no	Fiber percentage	7 days Split tensile strength (N/mm^2)	14 days Split tensile strength (N/mm^2)	28 days Split tensile strength (N/mm^2)
1	0%	1.43	2.5	3.19
2	0.25%	1.56	2.59	3.70
3	0.5%	1.87	3.28	4.27
4	0.75%	2.04	2.91	3.83
5	1%	1.59	2.60	3.62

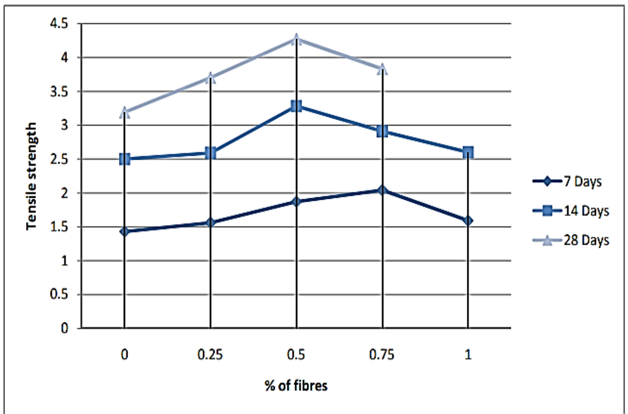

Figure 15: Tensile Strength

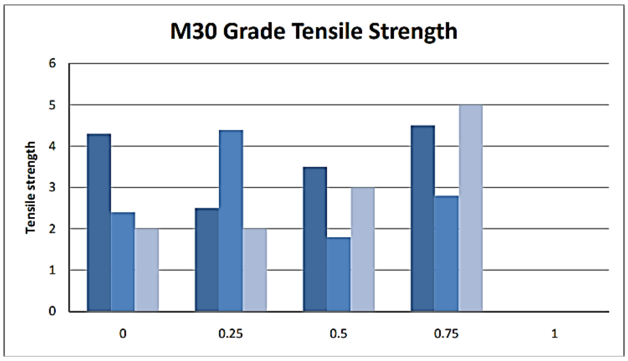

Figure 16: M30 Grade Tensile Strength

3) *Flexural Strength Values*

Table 14: Flexural Strength Values

S.no	Fibers Percentage	7 days Flexural tensile strength (N/mm^2)	14 days Flexural tensile strength (N/mm^2)	28 days Flexural tensile strength (N/mm^2)
1	0%	2.07	3.19	4.81
2	0.25%	2.86	4.31	5.34
3	0.5%	3.43	4.89	6.33
4	0.75%	3.04	4.46	5.87
5	1%	2.27	3.93	5.28

V. CONCLUSION

- From the results, it was found that the fibers of optimum strength were 0.5% in compressive strength and spilt tensile strength. 0.5% in the flexural strength test.
- The use of 0.5% of fibers is the optimal combination to achieve the desired need.
- The use of fibers improves durability by reducing maintenance cracks by reducing micro cracks and permeability. The use of Recron3s fibers has been shown to reduce segregation.
- Compressive strength shows an increase of 7.66% compared to ordinary concrete.
- The split tensile strength of fibers was increased at 0.5%.
- Split tensile strength shows an increase of 25.29% compared to conventional concrete.
- The flexural strength of fibers was increased at 0.5%.
- Flexural strength increased by 24.01% compared to conventional concrete.
- It has been found that cracking during spilt tensile testing is slower than conventional concrete. This shows that synthetic fibers are better in avoiding propagation of cracks.
- Research on Pozzolanic materials and fibers is still limited. But it promises a great range for future

research. The following aspects are considered for the following study and survey.

- While testing the specimens, the plain cement concrete specimens have shown a typical crack propagation pattern which leaded into splitting of beam in two-piece geometry. But due to addition of fibers to the concrete cracks eliminates the cracks that lead to ductile behavior of the fibrous concrete

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

REFERENCES

[1] Harish Kumar and Anandh., "Bond behavior of coconut fiber and recron fiber in concrete", IJRET: Journal of Engineering Technology, Vol.04, Issue No.04, eISSN: 2319- 1163, pISSN: 2321-7308, 2015.

[2] Leshma.K.R. “Experimental Investigation on Hybrid Fibre Reinforced Concrete Exterior Beam Subjected to Monotonic Loading”, International Journal of Science and Engineering Research, Vol 3, Issue No.04, pp.3221 - 5687, 2015.

[3] Anand S, Leeladhar Pammar., "Experimental Study on Hybrid Fiber Reinforced Concrete Structures", International Association for Science and Technology Innovation (ISO 3297: 2007 Certification Organization) Vol. 5, Special Issue 9, May 2016 By copyright Lee Myung Bak: 10.15680 / IJIRSET.2016.0505510 59.

[4] Ramesh. Bhaskar1, rudhvirajnaidu3., "A Review on Various Fiber Reinforced Self - Compacting Concrete" International Journal of Applied Mathematics, Vol.19 No.117 2018, 2771-2783.

[5] Akim Choudappa Yallappa, Marabathina Mahe swara Rao, Vinod Nagpue, "Experimentl Study of Recron 3s Fiber Reinforced Concrete", International Journal of Engineering and Development Emerging Trends, Issue 5, Vol. 6 (October-November 2015) ISSN 2249- 6149.